

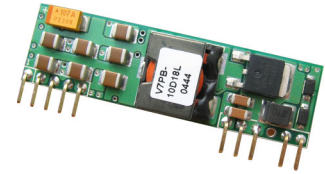
## NON-ISOLATED DC/DC CONVERTERS

3.0V-13.2V Input    0.9V-5.0V/10A Output

**bel**  
POWER PRODUCTS

### V7PB-10D Series

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Remote On/Off
- Under-voltage Lockout (UVLO)
- OCP/SCP
- Wide Input



### Description

The Bel V7PB-10Dxxx is part of the low cost non-isolated DC/DC power converter series. The modules use a SIP package for ease of layout and space savings. The output is closely regulated and the efficiency is typically 93% at full load. Typical features include Remote On/Off, under-voltage lockout, over-current protection and short circuit protection.

### Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typ. Efficiency at Vin=12V	Model Number Active Low	Model Number Active High
5.0V	8.0V – 13.2V	10A	50.0W	93%	V7PB-10D50L	V7PB-10D50S
3.3V	4.5V – 13.2V	10A	33.0W	91%	V7PB-10D33L	V7PB-10D33S
2.5V	3.1V – 13.2V	10A	25.0W	89%	V7PB-10D25L	V7PB-10D25S
1.8V	3.0V – 13.2V	10A	18.0W	86%	V7PB-10D18L	V7PB-10D18S
1.5V	3.0V – 13.2V	10A	15.0W	84%	V7PB-10D15L	V7PB-10D15S
1.2V	3.0V – 13.2V	10A	12.0W	81%	V7PB-10D12L	V7PB-10D12S
0.9V	3.0V – 13.2V	10A	9.0W	78%	V7PB-10D09L	V7PB-10D09S

**Note:** Add “G” suffix at the end of the model number to indicate “Tray Packaging”.

### Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	15V	
Output Enable Terminal Voltage	-0.3V	-	15V	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-40°C	-	125°C	

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	Vo=5.0V	8V	13.2V	
	Vo=3.3V	4.5V	13.2V	
	Vo=2.5V	3.1V	13.2V	
	Vo=0.9-1.8V	3.0V	13.2V	
Input Current (full load)	Vin=3.3V	-	10.0A	
	Vin=5.0V	-	8.8A	
	Vin=13.2V	-	5.5A	
Input Current (no load)	Vin=3.3V	-	200mA	
	Vin=5.0V	-	200mA	
	Vin=13.2V	-	150mA	

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## Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (pk-pk)	-	-	250mA	Tested with a 22uF tantalum input capacitor & simulated source impedance of 500nH, 5Hz to 20MHz.
Input Reflected Ripple Current (RMS)	-	-	70mA	
I <sup>2</sup> t Inrush Current Transient	-	0.04A <sup>2</sup> s	0.08A <sup>2</sup> s	
Turn-on Voltage Threshold	-	2.9V	-	
Turn-off Voltage Threshold				
Vo=5.0V	-	-	5.5V	
Vo=3.3V	-	-	3.8V	
Vo=0.9-2.5V	-	-	2.95V	

## Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				Test condition: Vin=12V, Iout=full load
Vo=5.0V	4.900V	5.0V	5.100V	
Vo=3.3V	3.247V	3.3V	3.353V	
Vo=2.5V	2.460V	2.5V	2.540V	
Vo=1.8V	1.772V	1.8V	1.828V	
Vo=1.5V	1.476V	1.5V	1.524V	
Vo=1.2V	1.181V	1.2V	1.219V	
Vo=0.9V	0.886V	0.9V	0.914V	
Load Regulation				
Vo=5.0V	-	10mV	20mV	
Vo=3.3V	-	6mV	16mV	
Vo=2.5V	-	6mV	12mV	
Vo=1.8V	-	5mV	9mV	
Vo=1.5V	-	3mV	7mV	
Vo=1.2V	-	3mV	6mV	
Vo=0.9V	-	3mV	5mV	
Line Regulation				
Vo=5.0V	-	2mV	10mV	
Vo=3.3V	-	2mV	10mV	
Vo=2.5V	-	2mV	8mV	
Vo=1.8V	-	2mV	5mV	
Vo=1.5V	-	2mV	5mV	
Vo=1.2V	-	2mV	5mV	
Vo=0.9V	-	2mV	5mV	
Regulation Over Temperature (-40°C to 85 °C)				
Vo=5.0V	-	8mV	35mV	
Vo=0.9-3.3V	-	5mV	35mV	
Output Current	0A	-	10A	
Current Limit Threshold	13A	-	25A	
Short Circuit Surge Transient	-	0.8A <sup>2</sup> s	1.5A <sup>2</sup> s	
<b>Ripple and Noise Vin=12V (Test condition: 0-20MHz BW, 22uF tan. capacitor on output)</b>				
Vo=5.0V	-	75mV	120mV	Pk-pk
Vo=3.3V	-	75mV	100mV	
Vo=2.5V	-	60mV	80mV	
Vo=1.5-1.8V	-	45mV	60mV	
Vo=0.9-1.2V	-	40mV	55mV	
Vo=5.0V	-	25mV	50mV	RMS
Vo=3.3V	-	25mV	40mV	
Vo=2.5V	-	20mV	35mV	
Vo=1.5-1.8V	-	15mV	25mV	
Vo=0.9-1.2V	-	12mV	20mV	

# NON-ISOLATED DC/DC CONVERTERS

3.0V-13.2V Input    0.9V-5.0V/10A Output



## Output Specifications (continued)

Parameter	Min	Typ	Max	Notes	
<b>Ripple and Noise Vin=5.0V</b> (Test condition: 0-20MHz BW, 22uF tan. capacitor on output)					
Vo=1.5-3.3V	-	35mV	70mV	Pk-pk	
Vo=0.9-1.2V	-	30mV	70mV		
Vo=0.9-3.3V	-	10mV	15mV	RMS	
<b>Ripple and Noise Vin=3.3V</b> (Test condition: 0-20MHz BW, 22uF tan. capacitor on output)					
Vo=2.5V	-	15mV	70mV	Pk-pk	
Vo=1.8V	-	20mV	70mV		
Vo=1.2-1.5V	-	25mV	70mV		
Vo=0.9V	-	30mV	70mV		
Vo=2.5V	-	5mV	15mV	RMS	
Vo=1.8V	-	6mV	15mV		
Vo=0.9-1.5V	-	8mV	15mV		
Turn on Time	-	-	80mS		
Overshoot at Turn on	-	-	5%Vo,set		
Output Capacitance	0uF	-	3300uF		
<b>Transient Response Vin=12V</b>					
50% ~ 100% Max Load	Vo=5V	-	100mV	150mV	di/dt = 0.5A/uS; Vin = 12V; Ta = 25°C and with a 470uF Aluminum capacitor at the output
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load	Vo=3.3V	-	100mV	150mV	
Settling Time		-	50uS	80uS	
50% ~ 100% Max Load	Vo=2.5V	-	80mV	120mV	
Settling Time		-	40uS	80uS	
100% ~ 50% Max Load	Vo=1.8V	-	60mV	100mV	
Settling Time		-	40uS	80uS	
50% ~ 100% Max Load	Vo=1.5V	-	60mV	100mV	
Settling Time		-	40uS	80uS	
100% ~ 50% Max Load	Vo=1.2V	-	40mV	80mV	
Settling Time		-	40uS	80uS	
50% ~ 100% Max Load	Vo=0.9V	-	40mV	80mV	
Settling Time		-	40uS	80uS	
100% ~ 50% Max Load	Vo=0.9V	-	40mV	80mV	
Settling Time		-	40uS	80uS	

# NON-ISOLATED DC/DC CONVERTERS

3.0V-13.2V Input    0.9V-5.0V/10A Output



## Output Specifications (continued)

Parameter	Min	Typ	Max	Notes
<b>Transient Response Vin=5.0V</b>				
50% ~ 100% Max Load	-	120mV	160mV	di/dt = 0.5A/uS; Vin = 5V; Ta = 25°C and with a 470uF Aluminum capacitor at the output
Settling Time	-	50uS	80uS	
100% ~ 50% Max Load	-	120mV	160mV	
Settling Time	-	50uS	80uS	
50% ~ 100% Max Load	-	110mV	150mV	
Settling Time	-	50uS	80uS	
100% ~ 50% Max Load	-	110mV	150mV	
Settling Time	-	50uS	80uS	
50% ~ 100% Max Load	-	80mV	120mV	
Settling Time	-	50uS	80uS	
100% ~ 50% Max Load	-	80mV	120mV	
Settling Time	-	50uS	80uS	
<b>Transient Response Vin=3.3V</b>				
50% ~ 100% Max Load	-	150mV	200mV	di/dt = 0.5A/uS; Vin = 3.3V; Ta = 25°C and with a 470uF Aluminum capacitor at the output
Settling Time	-	50uS	80uS	
100% ~ 50% Max Load	-	150mV	200mV	
Settling Time	-	50uS	80uS	
50% ~ 100% Max Load	-	130mV	180mV	
Settling Time	-	50uS	80uS	
100% ~ 50% Max Load	-	130mV	180mV	
Settling Time	-	50uS	80uS	
50% ~ 100% Max Load	-	120mV	160mV	
Settling Time	-	50uS	80uS	
100% ~ 50% Max Load	-	120mV	160mV	
Settling Time	-	50uS	80uS	
50% ~ 100% Max Load	-	140mV	180mV	
Settling Time	-	50uS	80uS	
100% ~ 50% Max Load	-	140mV	180mV	
Settling Time	-	50uS	80uS	
50% ~ 100% Max Load	-	120mV	160mV	
Settling Time	-	50uS	80uS	
100% ~ 50% Max Load	-	120mV	160mV	
Settling Time	-	50uS	80uS	

**Note:** All specifications are typical at 25°C unless otherwise stated.

# NON-ISOLATED DC/DC CONVERTERS

3.0V-13.2V Input    0.9V-5.0V/10A Output



## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency (Vin=12V, Io=Io-max )				
Vo=5.0V	90%	93%	-	
Vo=3.3V	87%	91%	-	
Vo=2.5V	85%	89%	-	
Vo=1.8V	81%	86%	-	
Vo=1.5V	80%	84%	-	
Vo=1.2V	77%	81%	-	
Vo=0.9V	73%	78%	-	
Efficiency (Vin=5.0V, Io=Io-max)				
Vo=3.3V	89%	92%	-	
Vo=2.5V	87%	90%	-	
Vo=1.8V	83%	87%	-	
Vo=1.5V	82%	85%	-	
Vo=1.2V	78%	81%	-	
Vo=0.9V	74%	77%	-	
Efficiency (Vin=3.3V, Io=Io-max)				
Vo=2.5V	89%	92%	-	
Vo=1.8V	84%	88%	-	
Vo=1.5V	82%	86%	-	
Vo=1.2V	80%	84%	-	
Vo=0.9V	77%	80%	-	
Switching Frequency				
Vo=0.9V	163KHz	170KHz	187KHz	
Vo=1.2-5.0V	180KHz	200KHz	220KHz	
Output Trim Range				
Vo=0.9V	-	-	120%Vo	
Vo=1.2-5.0V	90%Vo	-	110%Vo	
MTBF	2,140,721 hours			Calculated Per Bell Core TR-332 (Io =80%Io,max; Vo=1.8V; Vin=12V; Ta = 25°C)
Dimensions				
Inches (L x W x H)	2.0 x 0.55 x 0.387			
Millimeters (L x W x H)	50.8 x 13.97 x 9.84			
Remote sense compensation	-	-	10%	
Weight	-	10g	-	

**Note:** All specifications are typical at 25°C unless otherwise stated.

## Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit Off)	-0.3V	-	0.4V	V7PB-10DxxS
Signal High (Unit On)	2.8V	-	13.2V	
Signal Low (Unit On)	-0.3V	-	0.4V	V7PB-10DxxL
Signal High (Unit Off)	2.8V	-	13.2V	

## NON-ISOLATED DC/DC CONVERTERS

3.0V-13.2V Input

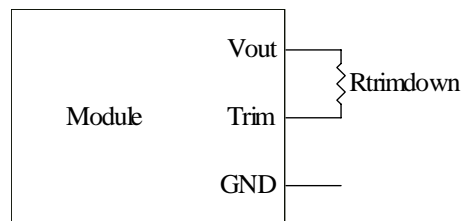
0.9V-5.0V/10A Output

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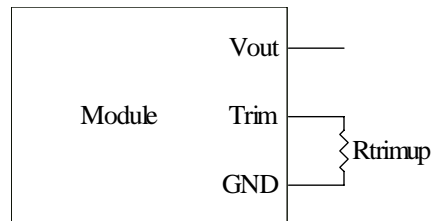
### Output Trim Equations

Equations for calculating the trim resistor (in k $\Omega$ ) given the desired adjusted voltage ( $V_{adj}$ ) and the nominal output voltage of the converter ( $V_{nom}$ ) are shown below. The Trim Down resistor should be connected between the Trim pin and  $V_{out}$ . The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

$$R_{TrimDown} = \frac{A}{V_{nom} - V_{adj}} - B$$



$$R_{TrimUp} = \frac{C}{V_{adj} - V_{nom}} - D$$



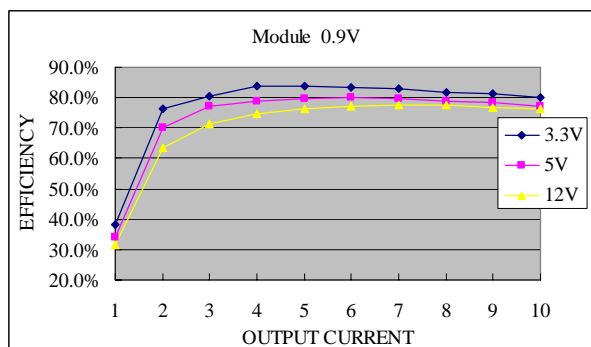
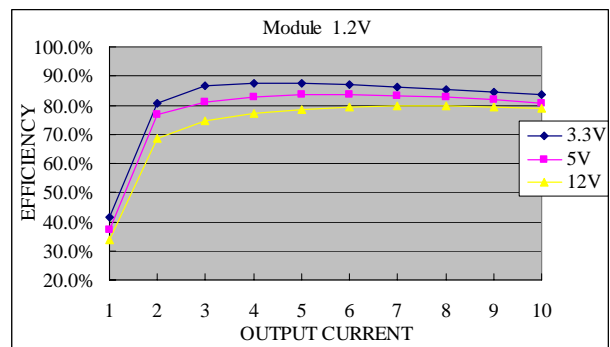
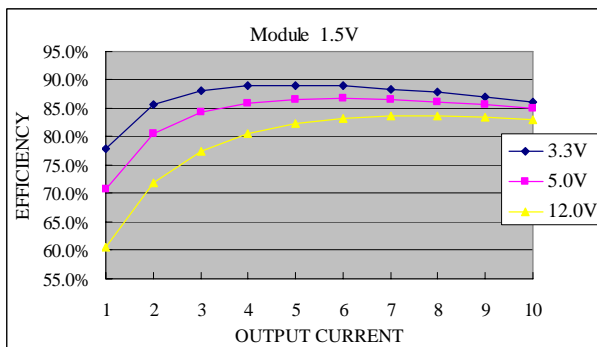
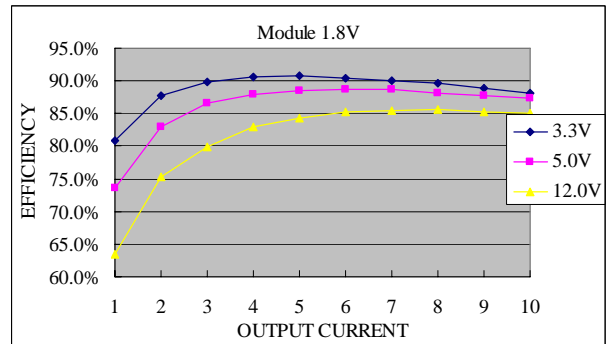
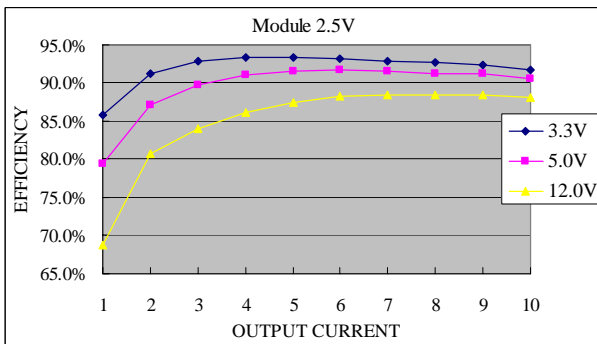
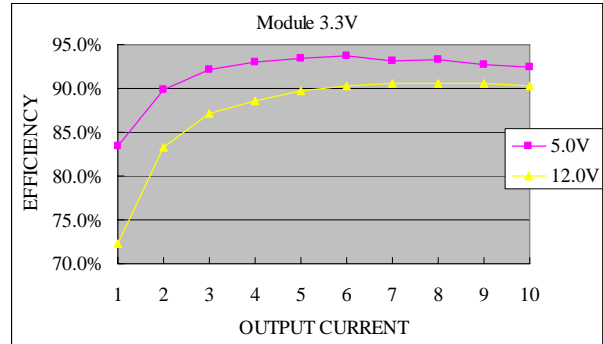
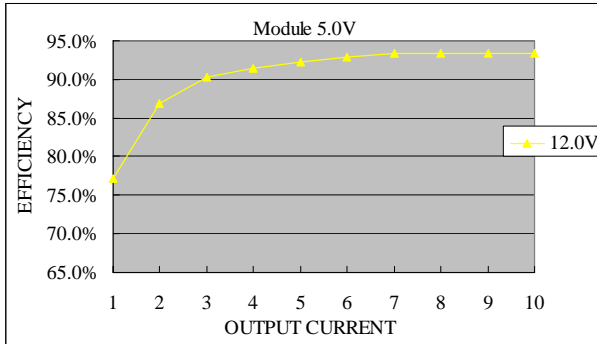
Vnom	A	B	C	D
5.5	31.58	17.51	6.01	10.00
3.3	11.63	13.74	3.72	9.09
2.5	7.92	13.74	3.72	9.09
1.8	4.69	21.55	3.72	16.90
1.5	3.25	21.55	3.72	16.90
1.2	1.78	9.07	3.54	4.64
0.9	-	-	1.46	0.909

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3.0V-13.2V Input 0.9V-5.0V/10A Output



## Efficiency Data

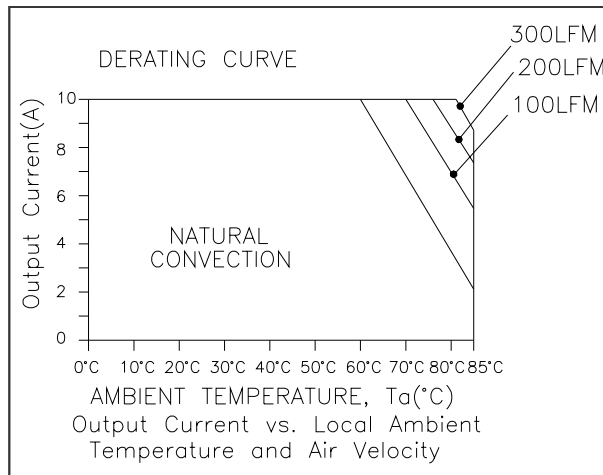


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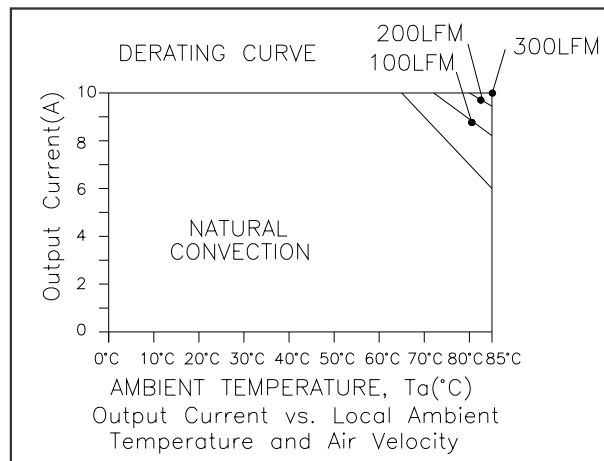
3.0V-13.2V Input    0.9V-5.0V/10A Output



## Thermal Derating Curves



Vin=13.2V

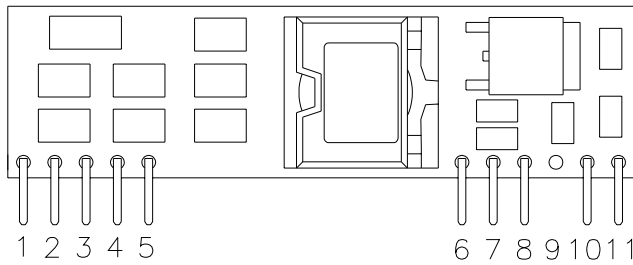
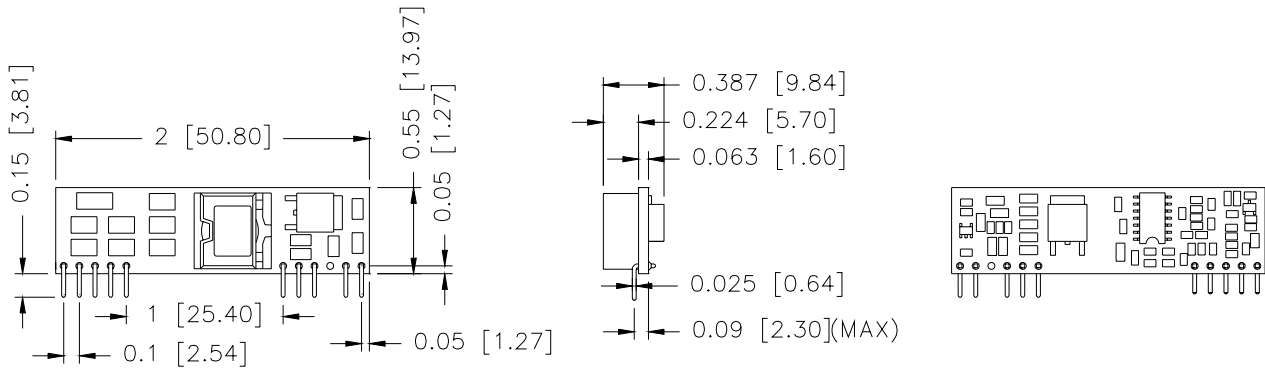


Vin=5.5V & Vin=3.63V



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3.0V-13.2V Input    0.9V-5.0V/10A Output



## Pin Connections

Pin	Function
1	Vo+
2	Vo+
3	Opt. Remote Sense (+)
4	Vo+
5	Ground
6	Ground
7	Vin+
8	Vin+
9	Not used
10	Trim
11	Remote On/Off

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